SPLASH SHUTTER FOR LAUNDRY MACHINE

Cross-Reference to Related Applications

[0001] This application claims the benefit of U.S. Provisional Application No. 60/436,710, filed December 27, 2002.

Technical Field and Background of the Invention

[0002] This invention relates to machines, such as washing, drying, dyeing machines or the like, and, more particularly, to a laundry machine including a loading hopper that incorporates a drum. Commercial/industrial machines used for laundering items are well known in the art, for example, applicant's United States Patent No. 5,357,772, incorporated herein by reference. Such machines are often quite large, holding up to 800 lbs. or more of laundry. Thus, the steps of loading and unloading the launderable items from these machines are usually time consuming and, when performed manually, can present awkward and hazardous conditions.

[0003] A conventional laundry machine is generally supported on a floor-mounted structural frame and is tilted relative to the horizontal into various operating positions. Such tilting is generally performed by hydraulic actuators but may be performed by other known actuator arrangements, including pneumatic actuators and the like. The machine includes a drum having an opening at a front end thereof through which the launderable items are delivered into and withdrawn from the drum. An access door is pivotally mounted on the front end of the machine to cover the opening and enclose the drum during the washing cycles, and to permit access to the drum opening during loading and unloading.

[0004] During the loading process, the machine is tilted such that the front end is angled upwardly above horizontal and the access door is opened. While in this position,

the items to be laundered are placed into the drum through the opening and then the access door is closed.

[0005] Following this loading stage, the laundry machine is tilted to a substantially horizontal position and the items are laundered. When this stage is complete, the machine is tilted such that the front of the drum and the drum opening are angled downward to aid in the removal of the laundered items from the drum after the access door is again opened. Thereafter, the process is repeated.

[0006] As disclosed in U.S. Pat. No. 4,835,993 and applicant's '772 Patent referenced above, a hopper unit is pivotally attached to the machine above the drum opening. During the loading stage, the hopper unit is positioned against the front of the drum around the drum opening. Launderable items are then delivered into the drum through an open top of the hopper unit. Thereafter, the hopper is pivoted to a non-use position and the access opening is closed so that the items may be laundered.

[0007] The prior art arrangement disclosed in the '993 patent permits the drum of the machine to be rotated without subjecting a worker to injury during loading of the machine. In addition, since the launderable items are generally contained in large bags and delivery of the launderable items through the hopper unit is aided by gravity, substantially the entire loading operation of the machine can be performed without the worker directly contacting the launderable items. Instead, the worker merely has to open the various bags above the upper open end of the hopper unit. To further aid in loading the machine, the arrangement disclosed in the '993 patent provides for a supply of water to be delivered through the hopper unit.

[0008] The '772 Patent invention provides an improved laundry machine that significantly simplifies and enhances operator safety and the efficiency of the machine from cost, time and capacity standpoints. The laundry machine according to the '772 Patent comprises a drum having an opening through which launderable items may be delivered

into and withdrawn, and a hopper unit that defines an internal passage between first and second open ends. The hopper unit is pivotally mounted to the laundry machine between an in-use position in which the second open end of the hopper unit is aligned with the drum opening for loading the machine, and a non-use position in which the hopper unit is positioned remote from the drum opening to permit unloading of the drum. The hopper unit includes a splash door mounted within the internal passage that is movable between an open position wherein launderable items can freely pass through the internal passage and a closed position wherein the splash door closes the internal passage. In a later version of the laundry machine the splash door is mounted to pivot within the internal passage from above the drum opening.

[0009] With this arrangement, the hopper unit remains in its in-use position during both loading and laundering stages of operation of the machine. During the loading stage, the splash door assumes its open position in order to readily permit launderable items to be delivered into the drum through the hopper unit and, during the laundering stage of operation, the splash door is closed to provide splash and/or vapor control. The portion of the internal passage between the closure member and the drum opening can further hold launderable items that can be drawn into the machine during operation such that the capacity of the machine is increased. The laundry machine arrangement disclosed in the '772 Patent is particularly adapted to be used in an automated laundering system where the position and operational modes of the drum, hopper unit, closure member and spray nozzles are automatically controlled in a timed and systematic fashion. With this arrangement, a cost effective laundry machine having a minimum cycle time, with increased safety and operating capacity, is provided.

[0010] The present invention reserves all of the advantages of the hopper and splash door design of the '772 Patent while providing additional advantages by eliminating

the door within the hopper passage in favor of a shutter that is positioned outside of the hopper at all times.

Summary of the Invention

[0011] Therefore, it is an object of the invention to provide a means of covering the hopper of a laundry machine that eliminates the splash door.

[0012] It is another object of the invention to provide a laundry machine wherein there is no door or other similar structure within the hopper.

[0013] It is another object of the invention to provide a laundry machine with a splash shutter that does not require any overhead clearance above the laundry machine.

[0014] It is another object of the invention to provide a splash shutter for a laundry machine that has fewer moving parts.

[0015] It is another object of the invention to provide a splash shutter for a laundry machine that avoids jamming by laundry caught between the side of a door and the hopper sidewalls.

[0016] It is another object of the invention to provide a splash shutter for a laundry machine that is lighter than a door.

[0017] It is another object of the invention to provide a splash shutter for a laundry machine that does not require the use of pneumatic or hydraulic cylinders.

[0018] It is another object of the invention to provide a splash shutter for a laundry machine that provides a better seal with the hopper than a door and thus further reduces leakage from the laundry machine.

[0019] It is another object of the invention to provide a splash shutter for a laundry machine that is easier to replace when replacement is required.

[0020] It is another object of the invention to provide a splash shutter for a laundry machine that is less susceptible to damage.

[0021] These and other objects are meet by the present invention, which in one embodiment provides a hopper for a laundry machine having a rotating drum. The hopper comprises front, lower, and side walls which cooperatively define a structure having closed bottom and side surfaces, an open rear surface for being disposed in communication with the interior of the drum, and an upper hopper opening for receiving therethrough items for introduction into the drum. A splash shutter is disposed above the hopper opening, and is movable between an open position wherein the hopper opening is exposed for receiving items therethrough, and a closed position wherein the hopper opening is covered for retaining the contents of the laundry machine.

[0022] According to another preferred embodiment of the invention, the shutter comprises a plurality of interlocked parallel slats.

[0023] According to another preferred embodiment of the slats are captured in a pair of opposed, spaced-apart end cap tracks carried on the tops of the hopper's side walls.

[0024] According to another preferred embodiment of the invention, a tube is connected to a first end of the shutter, and the slats are rolled onto the tube when the shutter is in a closed position. Means are also provided for rotating the tube.

[0025] According to another preferred embodiment of the invention, a cord is connected to the tube. The cord is routed through at least one pulley and connected to a second end of the shutter opposite the first end, so as to maintain tension on the slats while the shutter is opened and closed.

[0026] According to another preferred embodiment of the invention, the side walls of the hopper are generally planar and disposed in spaced-apart relationship, the front wall is generally planar and connected to the side walls, and the lower wall is arcuate and connected to the side walls and the front wall.

[0027] According to another preferred embodiment of the invention, an observation window is disposed in one of the walls of the hopper.

[0028] According to another preferred embodiment of the invention, a laundry machine comprises a frame and a drum rotatably supported in the frame, the drum having an opening for receiving items to be processed. A hopper is disposed in communication with the opening. The hopper comprises front, lower, and side walls which cooperatively define a structure having closed bottom and side surfaces, an open rear surface for being disposed in communication with the interior of the drum, and an upper hopper opening for receiving therethrough items for introduction into the drum. A splash shutter is disposed above the hopper opening. The shutter is movable between an open position wherein the hopper opening is exposed for receiving items therethrough, and a closed position wherein hopper opening is covered for retaining the contents of the laundry machine.

Brief Description of the Drawings

[0029] Some of the objects of the invention have been set forth above. Other objects and advantages of the invention will appear as the invention proceeds when taken in conjunction with the following drawings, in which:

[0030] Figures 1-4 are perspective views of a laundry machine with a splash shutter according to a preferred embodiment of the present invention in closed, partially open and fully open positions; and

[0031] Figure 5 is a perspective view with parts broken away of a splash shutter according to one preferred embodiment of the present invention.

Description of the Preferred Embodiment and Best Mode

[0032] Referring now specifically to the drawings, a laundry machine of the present invention is generally indicated at 10 and comprises a machine for washing launderable items (not shown), such as linens and the like. The present preferred embodiment of the machine 10 is structurally equivalent to a Jensen L-Tron AutoPro commercial washer with the exception of the splash shutter that is substituted for the splash door of the '772 Patent, described below. Laundry machine 10 includes a drum (not shown) that is rotatably mounted between a front plate 11 and a rear plate 12. The drum is adapted to receive launderable items through an opening 15 provided in front plate 11.

[0033] Laundry machine 10 further includes a base 17 upon which the drum is mounted. The drum is mounted to be tilted relative to the base 17 between loading, laundering and unloading positions. The drum may be tilted by pneumatic or hydraulic piston and cylinder assemblies, air bags or other known lifting elements. The manner in which drum is tilted is commonly known in the art and is not considered an inventive aspect of the present invention. It is not further discussed in this application.

[0034] The laundry machine 10 further includes a hopper 20 which includes a front wall 21, an arcuate lower wall 22 and a pair of side walls 23 and 24. The front wall 21 may optionally include an observation window 25. The hopper 20 has an upwardly directed opening 27. The front wall 21, lower wall 22 and side walls 23 and 24 define a hopper passage through which the laundry passes as it is being introduced to or withdrawn from the drum. The hopper is 20 is moved between the position shown in Figures 1-4 and a retracted position for unloading by an actuator 28. In the retracted position, the hopper 20 is rotated upwardly by the actuator 28 so that the access opening 15 of the drum is exposed. With the drum in the forward-tilted unloading position the laundry may be removed.

[0035] In accordance with the invention a splash shutter 30 is provided that seals hopper opening 27 across the top of the hopper 20. The splash shutter 30 is therefore not

positioned in the hopper passage but above the hopper passage across and above the hopper opening 27. It therefore avoids the possibility of laundry items being pinched or trapped between the door and the side walls of the hopper and jamming the door, as may occur in prior art constructions. Damage to the door from laundry items in the hopper is also eliminated.

[0036] According to a preferred embodiment of the invention, the splash shutter 30 is adapted from a rolling shutter such as the "Studio Star" shutter manufactured by AluTech United, Inc. of Selbyville, Delaware. As shown in Figures 1-4, the splash shutter 30 comprises a plurality of parallel, interlocked slats 31 captured in a pair of opposed, spaced-part end cap tracks 34, 35 carried on the top of the side walls 23, 24, respectively. The slats 31 are moved relative to the hopper opening 27 by a motor that extends the slats 31 from a housing 38 as the shutter 30 is being closed, and retracts the slats 31 into the housing 38 as the shutter 30 is being opened to expose the hopper opening 27.

[0037] The shutter 30 is shown fully closed in Figure 1, partially closed in Figures 2 and 3, and fully open in Figure 4.

[0038] The shutter 30 has slats 31 that are fabricated from plastic, aluminum, stainless steel, or other materials. In each case, the slats have powder-coated paint finishes that resist chemicals.

[0039] As is shown in Figure 5, the housing 38 of the splash shutter 30 contains a tubular motor 40 that rotates an octagonal tube 41 around which the slats 31 are wound. Side caps 43, 44 enclose the housing 38 on opposite ends and carry bearings on which the tube 41 rotates. A pulley spool 46 contains a cord 47 that permits a pulley 49 to maintain tension on the slats 31 and thus smooth operation of the shutter 30 during both opening and closing.

[0040] A hopper for laundry machine, and a machine incorporating the hopper are described above. Various details of the invention may be changed without departing from

its scope. Furthermore, the foregoing description of the preferred embodiment of the invention and the best mode for practicing the invention are provided for the purpose of *illustration only and not for the purpose of limitation--the invention being defined by the* claims.